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What Happened to our Oats in 1953?

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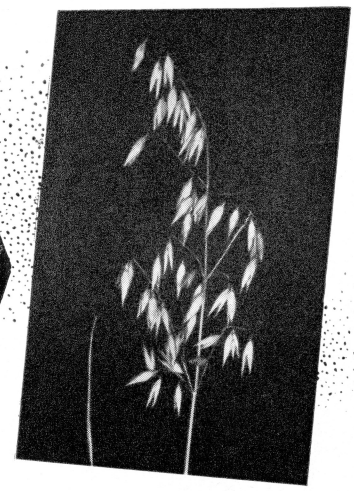

Stem rust, crown rust, temperatures, moisture and—believe it or not—hurricanes, tornadoes and windstorms all combined forces to wreak havoc with Iowa's 1953 oat crop. Here is the story and a look ahead.

by K. J. Frey, Arden Sherf, H. C. Murphy and R. E. Atkins

YOU MAY be one of many Iowa farmers wondering "What went wrong with my oats this year?" and "What can I do to make sure that it won't happen again next year?"

The first question is easier to answer than the second. Actually, Iowa was headed for a bumper oat crop early last summer until heading time. What happened? Along came *stem rust* and *crown rust* (also called leaf rust). These literally sapped the life blood from Iowa's 1953 oat crop!

The Cause . . .

The rust diseases are caused by organisms — called fungi — too small to be seen with the naked eye. Millions of these rust fungus spores can be floating in the air around us without our knowledge. When the spores light on an oat leaf, they sprout and produce a "rust plant" in the oat tissue. And, in about 10 to 14 days, the rust plant produces more spores, or "rust seeds," which are blown into the air to infect other oat plants.

To have heavy rust damage such as we had last summer, it's necessary to have ideal conditions for rust and an abundant supply of rust spores. Rust grows best when the weather is warm and there's plenty of dew at night. The spores germinate in the droplets of dew on the oat leaves and then grow into the leaf tissue. Warm temperatures and moist conditions help rust grow fast and produce more spores very rapidly.

Where From?

Stem and crown rust spores come from two sources:

- Some spores are produced locally on an "alternate host"—common barberry for stem rust and buckthorn for crown rust. These shrubs allow the overwintering rust organisms—which, incidentally, can't infect oat plants directly—to change to spore types which *can* grow on oats. When oats are maturing, the rust produces a type of spore called "black spores" which can stand severe winter weather. While these black spores can't grow on oat plants, they can grow on the alternate hosts where they can change to an oat-infecting type. Early summer infection of rust on oats usually comes from this source—appearing as much as 2 weeks earlier than rust blown up from the South.

- Other spores come from the southern states where rust can overwinter on oat plants. Spores from rusted oat plants there are carried to the northern states by air currents in the spring and summer. Usually the rust diseases move northward in a stepwise process—a few miles at a time and, thus, often arrive too late to damage the oat crop in Iowa.

Perhaps you'll recall the hurricanes, tornadoes and windstorms that swept the South (and other regions too) earlier this year. The result: Rust spores were swept up in the big gusts and scattered as far north as Canada. And the rust spores arrived in Iowa before the oat crop was headed and proceeded to infect the oats and produce more spores.

What Happens . . .

Rust diseases literally make the oat plants die of thirst and hunger. Whenever a rust spot occurs on an oat leaf or stem, it destroys some of the green cells which manufacture food to fill the oat kernels. If half of the leaf surfaces are covered with rust spots, the plant produces less food. Also, the rust organisms draw food for their own needs from the reduced supply of food being produced by the plant.

Rust also interferes with water movement in the oat plants. Stem

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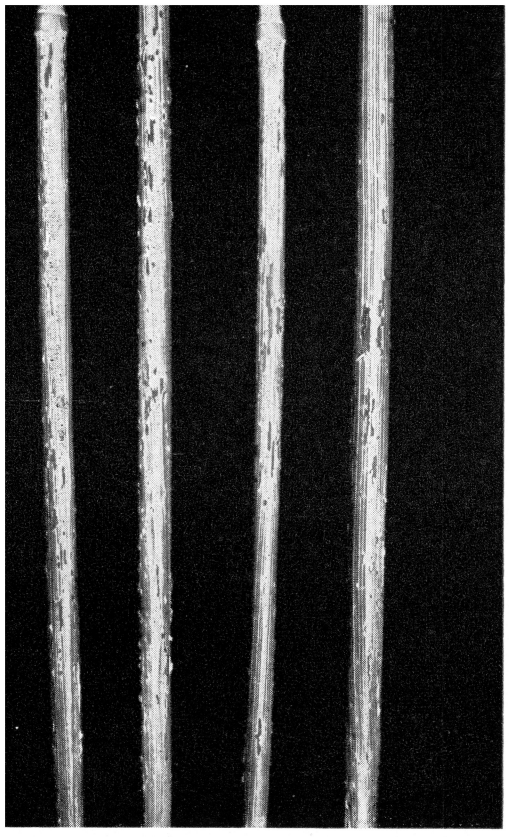


STEM RUST (above): There was more damage from stem rust in Iowa last summer than in any year since 1926.

rust ruptures the stem of oat plants, and, on days when there's a hot, dry wind, the plant dries out, wilts and may die. In 1953 some oat fields died 2 weeks before normal ripening time because of rust. Cases are common in some of the extreme southern states where oats are killed by rust before heading time.

Crown rust usually causes more damage in Iowa than stem rust. However, there was more damage from stem rust in 1953 than in any year since 1926. Clinton, Shelby and a number of other Bond-derived varieties were infected and killed by crown rust before stem rust became serious. Some varieties, which stayed green during the early crown rust epidemic, were hit later with stem rust—cutting their yields and test weights and killing the plants. Even the new crown rust-resistant varieties, Clintland and Clintafe, were severely damaged by race 7 of stem rust.

Why?

You might ask, "Why are varieties that once were resistant to stem and crown rust now susceptible to these diseases?" Actually, the oat varieties have not changed. But the rust organisms have. Clinton variety is just the same genetically as it always has been, but in 1953 there were different varieties or races of crown and stem rust than there were in 1946.

Just as new varieties of oats are produced by oat breeders when older varieties become unproductive, new races of rust are produced in nature when the old races become unproductive. Clinton, Cherokee, Nemaha, Benton and other oat varieties resisted the races of crown and stem rust prevalent when they were introduced. But new races which could grow and reproduce on the Bond varieties soon began to predominate, resulting in the epidemics of last summer. Thus goes the never ending struggle between oat varieties and oat rusts.

What Can You Do?

What can you do to forestall a similar catastrophe to your oat crop in 1954? Probably the first thing is to get seed of varieties which resist most of the prevalent races of rust. Of course, there may not be any rust next year if weather conditions are unfavorable for rust, but we can't depend upon this.

Clinton now is very susceptible to the prevalent races of crown rust and race 7 of stem rust, while Cherokee, Nemaha and Bonham are somewhat tolerant to the crown rust races. These last three varieties are early maturing which helps them escape rust damage. Mo. O-205, though somewhat weak strawed, is resistant to the prevalent crown rust races and race 7 of stem rust. This variety is medium early and has gray kernels with a low hull percentage.

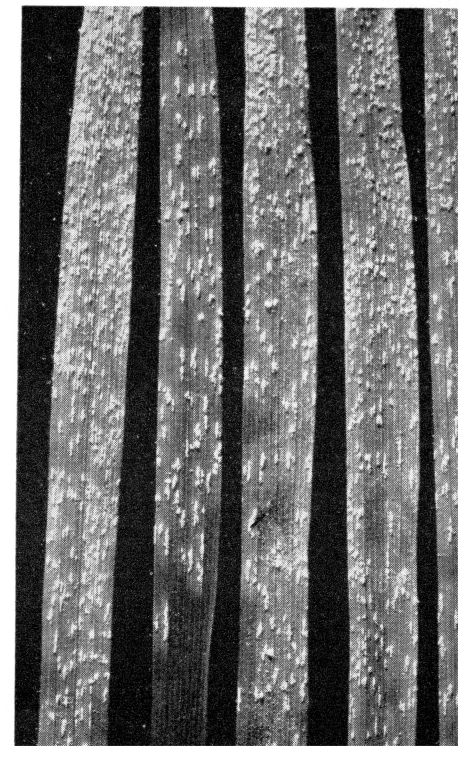
Andrew is a medium early variety with some tolerance to crown rust and resistance to race 7 of stem rust. Among the later maturing varieties, Ajax and Branch have moderate resistance to the current crown rust races and good resistance to race 7 of stem rust. However, both varieties are weak strawed and produce low test-weight grain. Probably they should not be grown on highly fertile soil because of the danger of lodging.

Two new varieties, both resistant to all races of crown rust known to be present in North America, now are being increased for distribution in Iowa. They are Clintafe and Clintland, developed by the Iowa and Indiana agricultural experiment stations, respectively, in cooperation with USDA. Seed of Clintland, however, won't be available until the 1955 planting season. Clintafe is several days later in maturity, 1 or 2 inches taller, a little lighter in test weight than Clinton, while Clintland is almost identical to Clinton in these respects but more resistant to rusts.

There just is no "ideal" oat variety—one with combined resistance to crown and stem rust, Septoria black stem and other oat diseases and with good yielding ability and other desirable agronomic characteristics.

Choice of any oat variety for 1954 planting involves some gamble. For example, if there were to be a prevalence of race 7 of stem rust next year, the best varieties to plant would be those resistant to race 7 such as Mo. O-205, Andrew, Ajax or Branch. If race 8 of stem rust were prevalent, the best varieties would be those resistant to race 8 such as Clintafe, Cherokee, Nemaha or Clintland.

CROWN RUST (below): In this state, crown rust usually causes more damage to the oat crop than stem rust.



Clumps of tall green oats in cattle dropping areas (note darker spots in photo above) indicate need of additional nitrogen. Nitrogen and phosphorus are the two fertilizer elements most generally lacking.

It's very likely that if significant acreages of Mo. O-205 are planted in the next several years, race 8 of stem rust will become more prevalent than race 7.

This situation points out the need for diversification in growing oat varieties. It would seem wise for each farmer to plant two or more varieties on his farm. The varieties selected should have differing disease resistance and different dates of maturity. Cherokee, Mo. O-205 and Clintafe, for example, would make a good combination of varieties for central Iowa. This spreads the risk of growing oats, helps to insure against crop failure and, in addition, spaces the harvest dates of the oat crop.

Clean and treat: Regardless of the oat variety you select, there are two "musts": (1) Use clean seed. (2) Treat the seed with Ceresan or Panogen. Most oat fields have enough weeds without adding more with uncleaned oat seed. Even though all of the varieties listed above, except Ajax, are resistant to oat smut, seed treatment still gets the young oat seedlings off to a better start in the spring and helps protect against seed rot.

Cultural practices: There's no substitute for good cultural methods to produce high oat yields. Plowing, on the average, increases oat yields by 4 to 6 bushels per acre over disking. Plowing gives a good, clean field with no piles of cornstalks to interfere with oat and forage seed planting.

After you prepare a good seedbed, it pays to drill instead of broadcasting oats on top of the ground. Drilling not only increases yields an average of 2 to 5 bushels per acre but requires less seed for planting. When oats are broadcast and disked into the soil, many seeds are covered too deeply, while others lie on the surface, and stands tend to be spotty. It takes about 2 to 4 pecks more seed per acre for broadcasting than for drilling.

The old argument that oat land should be disked and oats seed broadcast to get the oats planted early for maximum yield isn't entirely valid. Oat yields do not decrease with every day of delay in planting at the beginning of the planting season. If the planting season begins before April 15, there's generally little or no yield decrease if oats are planted anytime during the first week. Good seedbed preparation and drilling seed pay off in higher oat yields.

Management: In most instances, oats follow corn in a rotation. Since high-yielding corn crops deplete soil fertility, oats get off to a slow start when not fertilized. You can find evidence of the need for fertilization in oats grown on fields where corn was fertilized in the row the previous year. There are regular ridges of tall oats in the former corn rows and hollows of low oats in between the corn rows.

The fertilizer elements most generally lacking are nitrogen and phosphorus. Clumps of tall green oats in cattle dropping areas also show the need for additional fertility. Nitrogen, especially, is lacking in the spring when the oat crop is just starting. The soil temperature still is too cold for the nitrifying organisms to become active, and the oat seedlings must live on the limited nitrogen supply that is present.

Under average conditions, every 2½ pounds of nitrogen applied at oat planting time (up to 30 pounds per acre) will increase oat yields 1 bushel per acre. From 40 to 60 pounds of P_2O_5 usually results in yield increases of 4 to 6 bushels per acre. Just what amount you should use can best be determined by a soil test.

Weed control: Weed control can also help to increase oat yields. The best time to start control is with seedbed preparation. The first crop of weed seedlings can be killed very easily by disking and harrowing. This lets the oats "get ahead" of the weeds.

For broadleafed weeds that infest oat fields not seeded to legumes, an application of 2,4-D when the oats are from 8 to 10 inches high is effective. This treatment won't kill milkweed and smartweed, but it will set them back giving the oats a better competitive chance. It may even pay to cut patches of thistles and milkweeds above the oat plants with a scythe. Weeds not only cut yields but cause difficulties at harvest time. Weedy fields have to be windrowed before combining, and even then the weeds result in higher-moisture grain.

Don't Give Up

Oat growing can be profitable if you use the proper varieties and cultural practices. This is proven by the farmers who are able to get 60, 70 or more bushels of oats per acre. Oats are good feed for livestock — especially for young pigs and chickens — and they make an excellent nurse crop for establishing forage seedings.

Regardless of the unusual experiences of 1953, oats still are an excellent crop to grow.